

NANOTECHNOLOGY AND HUMAN HEALTH: SCIENTIFIC EVIDENCE AND RISK GOVERNANCE

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Background and aims: Besides the promise of great benefits of nanotechnology, concerns exist on adverse health consequences. As complexity and uncertainty are large, evidence-based policy will be elusive, and models of risk governance are needed.

Methods: WHO/EURO is conducting a critical assessment of key evidence on possible health implications of nanomaterials, with a view to identify options for risk governance and policy formulation.

Results: Current evidence is far from being conclusive but a cautionary approach in policy may be appropriate for several reasons: (i) humans have limited evolutionary experience of nanomaterials- a possible reason for the diminishing ability of cells to interact with particles as their size decreases to nanoscale; (ii) nanoparticles can enter the body relatively easily, especially through inhalation and gastro-intestinal assimilation, and are very mobile once inside the body; (iii) several chemical-physical mechanisms resulting in cell damage have been reported; (iv) effects are often dependent on particle size, with a tendency to become more active as the particle size decreases; (v) population exposure to nanomaterials is not well known, but may be or become high, for example through cosmetics, food additives, or from airborne nanoparticles; (vi) potential adverse effects include a broad spectrum of adverse effects, specific and a-specific. The need for caution is reinforced by the reported asbestos-like action of carbon nanotubes in animal models and, to a lesser extent, by a few episodes of human health impacts following localised acute exposures.

Conclusions: Assessing the risks for human health impacts of nanotechnology is challenging. One must take into account the unique complexities of the interaction between nanomaterials and the human body. Innovative models and frameworks for risk assessment and risk governance are being developed and applied in order to organise the available evidence on biological and health effects of nanomaterials in ways to inform policy.